

WHAT IS CLAIMED IS

1. An intake quantity control apparatus for an internal combustion engine having a valve opening characteristic control means for controlling a valve opening characteristic of at least one of an intake valve and an exhaust valve and an intake pressure control means for controlling an intake pressure and controlling said valve opening characteristic and said intake pressure so as to control the intake quantity, comprising:

a target intake quantity determining means for determining a target intake quantity for after elapse of a predetermined time,

a means for determining a range of valve opening characteristic realizable in a predetermined time by said valve opening characteristic control means, and

a means for determining a range of intake pressure realizable in a predetermined time by said intake pressure control means,

said valve opening characteristic and said intake pressure being controlled by said valve opening characteristic control means and said intake pressure control means so as to become a target valve opening characteristic and target intake pressure set in said realizable ranges based on said target intake quantity.

2. An intake quantity control apparatus for an internal combustion engine as set forth in claim 1, further comprising

a means for estimating a valve opening characteristic and intake pressure for realizing said target intake quantity by a predetermined method, wherein

when both said valve opening characteristic and intake pressure estimated by said means are in said realizable ranges, said estimated valve opening characteristic and intake pressure are set as said target valve opening characteristic and said target intake pressure, while

when at least one of said estimated valve

opening characteristic and intake pressure is not in said
realizable range, a valve opening characteristic and
intake pressure in said realizable ranges whereby said
intake quantity becomes closest to said target intake
5 quantity or said intake quantity becomes said target
intake quantity are set as said target valve opening
characteristic and said target intake pressure.

3. An intake quantity control apparatus for an
internal combustion engine as set forth in claim 1,
10 wherein when determining said range of valve opening
characteristic realizable in a predetermined time,
additional restrictions relating to operation of the
internal combustion engine are considered.

4. An intake quantity control apparatus for an
15 internal combustion engine as set forth in claim 3,
wherein said additional restrictions relating to
operation of the internal combustion engine include a
positional relationship and valve opening characteristics
of the intake and exhaust valves.

20 5. An intake quantity control apparatus for an
internal combustion engine as set forth in claim 1,
wherein when determining said range of intake pressure
realizable in a predetermined time, additional
restrictions relating to operation of the internal
25 combustion engine are considered.

6. An intake quantity control apparatus for an
internal combustion engine as set forth in claim 5,
wherein said additional restrictions relating to
operation of the internal combustion engine include
30 maintaining the intake pressure at not more than a
predetermined pressure.

7. An intake quantity control apparatus for an
internal combustion engine controlling an intake quantity
by a valve opening characteristic control means for
35 controlling a valve opening characteristic of at least
one of an intake valve and an exhaust valve and an intake
pressure control means for controlling an intake

pressure, comprising:

a target intake quantity determining means for determining a target intake quantity for after elapse of a predetermined time,

5 a target valve opening characteristic determining means for determining a target valve opening characteristic of said valve opening characteristic control means based on said target intake quantity,

10 a target intake pressure determining means for determining a target intake pressure of said intake pressure control means based on said target intake quantity and said target valve opening characteristic,

15 a means for determining a range of valve opening characteristic realizable in a predetermined time by said valve opening characteristic control means,

a means for determining a range of intake pressure realizable in a predetermined time by said intake pressure control means,

20 an operation region determining means determining a realizable operation region from ranges of realizable valve opening characteristic and intake pressure, and

25 a target value resetting means for determining a suitable operation point from said range of operation region when the operation point determined from said target valve opening characteristic and said target intake pressure is not in said realizable operation region and resetting the target values of said valve opening characteristic control means and said intake pressure control means from said operation point.

30 8. An intake quantity control apparatus for an internal combustion engine as set forth in claim 7, wherein said target value resetting means determines an operation point able to realize said target intake quantity or an intake quantity resembling said target intake quantity in said range of realizable operation region and resets the target values of said valve opening

characteristic control means and said intake pressure control means from that operation point.